Claims

What is claimed is:

1. A shade control system comprising:

a plurality of drive units each having a motor adapted for moving an associated shade member;

a plurality of drive unit controllers each capable of generating command signals for directing at least one of the drive units to move its associated shade member;

a communication bus capable of transmitting the command signals, each of the drive units and drive unit controllers connected to the communication bus in a common arrangement such that each one of the drive units and drive units controllers can communicate with every other drive unit and drive unit controller connected to the communication bus.

2. The shade control system according to claim 1, further comprising a microprocessor associated with at least one of the drive units and drive unit controllers, the microprocessor being programmed to automatically address each one of the drive units and drive unit controllers with a unique identifier.

3. The shade control system according to claim 1, wherein the plurality of drive unit controllers includes at least one wall-mountable keypad controller having actuators for controlling the movement of the associated shade member of at least one of the drive units.

4. The shade control system according to claim 1, wherein the plurality of drive unit controllers includes at least one contact closure interface capable of generating command signals for controlling the movement of the associated shade member of at least one of the drive units, the contact closure interface having multiple inputs for connection of an alternate device or control system to the contact closure interface.

5. The shade control system according to claim 1, wherein the shade members associated with the drive units are shade fabrics wound on a roller tube and wherein the motor of each drive unit operably engages the roller tube for rotation of the tube.

6. The shade control system according to claim 5, wherein the plurality of drive unit controllers includes at least one keypad controller having an open limit actuator and a close limit actuator for generating command signals for moving the associated shade fabric of at least one of the drive units to an open limit position and a close limit position, each of the at least one keypad controllers further including a raise actuator and a lower actuator for generating command signals for moving the associated shade fabric of at least one of the drive units through raise and lower position adjustments.

7. The shade control system according to claim 6, wherein the at least one keypad controller further includes at least one preset actuator each moving the shade fabric of at least one of the drive units to a preset position.

8. The shade control system according to claim 6, wherein the at least one keypad controller includes an infrared transmissible window for receiving an infrared signal within an interior of the keypad controller from a remotely located infrared transmitter.

9. The shade control system according to claim 8, wherein the infrared transmitter includes an open limit actuator and a close limit actuator for generating command signals for moving the associated shade fabric of at least one of the drive units to an open limit position and a close limit position, the infrared transmitter further including a raise actuator and a lower actuator for generating command signals for moving the associated shade fabric of at least one of the drive units through raise and lower position adjustments.

10. The shade control system according to claim 9, further including at least one external infrared receiver connectable to one of the drive units for receiving infrared signals from an infrared transmitter.

11. The shade control system according to claim 6, wherein each one of the keypad controllers includes a microprocessor programmed to automatically address all system components in response to actuation of the keypad controller actuators in a predetermined combination of actuators and/or actuation sequence.

12. The shade control system according to claim 11, wherein the microprocessor of each keypad controller is programmed to enter a system programming mode in response to simultaneous pressing and holding of the open and close limit actuators of the keypad controller and to initiate addressing of system components in response to subsequent pressing of the open limit actuator of the keypad controller.

13. The shade control system according to claim 11, wherein the microprocessor of each keypad controller is programmed to enter a limit setting program mode in response to simultaneous pressing and holding of the open limit and raise actuators of the keypad controller and to subsequently select drive units assigned to the keypad controller in response to actuation of either the open or close actuators of the keypad controller, and wherein the microprocessor is further programmed to set open and close limits for a selected one of the drive units following adjustment of the shade fabric by actuation of the raise or lower actuators of the keypad controller and subsequent pressing and holding of the open limit and close limit actuators, respectively.

14. The shade control system according to claim 11, wherein the microprocessor of each keypad controller is programmed to enter a drive unit assignment mode in response to simultaneous pressing and holding of the open and close limit actuators of the keypad controller and subsequent pressing of the close button, and wherein the

microprocessor is further programmed to (i) subsequently select drive units of the system in response to pressing and release of the open or close actuators of the keypad controller, and (ii) to assign or unassign a selected one of the drive units to the keypad controller in response to actuation of the lower and raise actuators, respectively.

15. The shade control system according to claim 5, wherein each of the plurality of drive units includes a control unit having a programmable microprocessor and a control panel having actuators adapted for raise and lower adjustment of the shade position and setting of open and close limits for the associated shade panel, respectively, and wherein the microprocessor of each drive unit is programmed to initiate automatic addressing of all system components in response to pressing and holding of the close limit actuator and subsequent pressing and releasing of the lower adjustment actuator.

16. The shade control system according to claim 3 further including a hand-held programmer connectable to the communication network, the programmer including liquid crystal display for presenting information to a user in the form of menu selection screens, numeric value screens and basic system information, the hand-held programmer further including a plurality of user-actuable buttons including a first pair of buttons for scrolling through a list of options displayed on a menu selection screen, the buttons further including a second pair of buttons for modifying a numeric value displayed on a numeric value screen.

17. A motorized shade control system comprising:

a plurality of drive units each having a motor adapted for engaging the roller tube of a motorized shade for rotation of the tube in each of opposite directions of rotation for raising and lowering a shade fabric wound onto the roller tube, each drive unit further including a control unit having a programmable microprocessor programmed to control the operation of the associated motor, and

a plurality of drive unit controllers each capable of generating command signals for directing the control unit of at least one of the drive units to move the associated shade fabric,

each of the drive units and drive unit controllers connected to a communication bus in a common arrangement in which each of the drive units and drive unit controllers can communicate with every other one of the drive units and drive unit controllers

the microprocessor of each drive unit and drive unit controller being programmed to initiate an automatic addressing of each of the drive units and drive unit controllers connected to the communication bus.

18. The motorized shade control system of claim 17, wherein the controllers include at least one wall-mountable keypad controller having actuators for generating signals directing the control unit of at least one of the drive units to respectively move the associated shade fabric to a selected one of an open limit position, a close limit position, and through raise and lower adjustments.

19. The motorized shade control system of claim 17, wherein the controllers include at least one contact closure interface generating command signals in response to user-actuation of a device or control system connected to the contact closure interface, the command signals directing the control unit of at least one of the drive units to respectively move the associated shade fabric to a selected one of an open limit position, a close limit position, and through raise and lower adjustments.

20. A method of controlling a motorized shade system comprising the steps of:

providing a plurality of drive units each having a motor adapted for moving an associated shade member;

providing a plurality of drive unit controllers each capable of generating command signals for directing at least one of the drive units to move its associated shade member;

connecting each of the drive units and drive unit controllers to a communication bus in a common arrangement in which each of the drive units and drive unit controllers can communicate with every other drive unit and drive unit controller connected to the communication bus.

21. The method of claim 20, further including the steps of:

including a plurality of keypad controllers in the drive unit controllers, each keypad controller including actuators for generating signals to direct movement of a shade member associated with at least one of the drive units;

providing a programmable microprocessor for each of the keypad controllers;

programming the microprocessor of each of the keypad controllers to initiate an automatic addressing of each of the drive units and drive unit controllers of the system in response to actuation of the keypad controller actuators in a predetermined combination of actuators or actuation sequence; and

actuating the actuators of a selected one of the keypad controllers in the predetermined combination of actuators or actuation sequence to initiate automatic addressing of the drive units and drive unit controllers by the microprocessor of the selected keypad controller.

22. The method of claim 21, wherein each of the shade member associated with each of the drive units is a shade fabric windingly received by a roller tube rotated by the motor of the drive unit and wherein the actuators of each keypad controller include open limit and close limit actuators for respectively directing the at least one drive unit to move the associated shade fabric to open limit and close limit positions and raise and lower actuators for adjusting the position of the shade fabric, and wherein the step of actuating the actuators to initiate addressing of a selected one of the keypad controllers includes the steps of

simultaneously pressing and holding the open and close limit actuators and subsequently pressing the open limit actuator.

23. The method of claim 20, wherein each of the shade member associated with each of the drive units is a shade fabric windingly received by a roller tube rotated by the motor of the drive unit and wherein the step of providing a plurality of drive units includes the steps of providing a programmable microprocessor for each of the drive units and providing a control panel for each of the drive units, the control panel having actuators for raise and lower adjustment of the position of the associated shade fabric and for setting open and close limit positions, respectively, and

wherein the method includes the further steps of:

programming the microprocessors of the drive units to initiate an automatic addressing of all of the drive units and drive control units by a selected one of the drive unit microprocessors in response to pressing and holding of the close limit actuator of the drive unit control panel and subsequent pressing of the lower adjustment actuator; and

initiating automatic addressing by pressing and holding the close limit actuator of one of the drive unit control panels and subsequently pressing the lower adjustment actuator.

24. The method according to claim 22, including the further steps of:

programming the microprocessor of each of the keypad controllers to assign drive units to the keypad controller in response to actuation of the keypad controller actuators in a predetermined combination of actuators and/or actuation sequence; and

assigning drive units to a selected one of the keypad controllers by cycling through the drive units of the system, and selectably assigning or unassigning chosen ones of the drive units to the selected keypad controller.

25. The method according to claim 24, including the further steps of:

programming the microprocessor of each of the keypad controllers to set open and close limits for the drive units assigned to the keypad controller in response to actuation of the keypad controller actuators in a predetermined combination of actuators and/or actuation sequence; and

modifying open and close limits for the drive units assigned to a selected one of the keypad controllers by cycling through the drive units assigned to the selected keypad controller, adjusting the position of the shade fabric associated with a chosen one of the assigned drive units, and setting the open and close limit positions.

26. The method according to claim 24, wherein the step of assigning drive units to a selected one of the keypad controllers includes the steps of:

entering a system configuration mode by pressing and holding the open and close limit actuators of the selected keypad controller;

subsequently pressing and releasing either the open limit button or close limit actuators to select drive units of the system; and

assigning or unassigning a selected one of the system drive units by pressing the lower or raise adjustment actuators respectively.

27. The method according to claim 25, wherein the step of modifying open and close limits for drive units assigned to a selected one of the keypad controllers includes the steps of:

entering a limit set mode by simultaneously pressing and holding the open limit and raise adjustment actuators of the selected keypad controller;

cycling through the drive units assigned to the selected keypad controller in a selected one of a forward and reverse order by respectively pressing either the open or close actuators of the keypad controller;

adjusting the position of a chosen one of the assigned drive units by actuating the raise and/or lower adjustment actuator of the selected keypad controller; and

setting the open and close limit positions by respectively pressing and holding the open limit and close limit actuators of the selected keypad controller.

28. The method according to claim 24, wherein the microprocessor of each of the keypad controllers is programmed to direct the drive units to raise and lower the associated shade fabric of the drive units over a short distance during the cycling of drive units to provide a visual indicator for a chosen drive unit.

29. The method according to claim 25, wherein the microprocessor of each of the keypad controllers is programmed to direct the drive units assigned to the keypad controller to raise and lower the associated shade fabric of the assigned drive units over a short distance during the cycling of drive units to provide a visual indicator for a chosen drive unit.

30. The method according to claim 25, wherein the step of providing keypad controllers includes the step of locating an LED adjacent a plurality of the actuators of each keypad controller to provide visual indicators during the steps of addressing drive units and drive unit controllers, assigning drive units to keypad controllers, and modifying open and close limits of the drive units.

31. The method according to claim 20 further including the steps of:

providing a programmable microprocessor for each of the drive units and each of the drive unit controllers;

addressing each of the drive units and each of the drive unit controllers with a device address number;

assigning at least one drive unit to each of the drive unit controllers for control by the drive unit controller;

setting preset positions for the shade member of each drive unit;

programming the microprocessor of each drive unit and drive unit controller to create a database of stored information that includes the device address number and an associated unique serial number for each of the drive units and drive unit controllers of the system;

programming the microprocessor of each drive unit to include in the database of stored information its preset position information as well as the device address numbers of all drive unit controllers assigned to it; and

programming the microprocessor of each drive unit controller to include in the database of stored information the device address numbers of all drive units assigned to it as well as the preset position information for the assigned drive units.

32. The method according to claim 31, further including the steps of:

removing one of the drive units or one of the drive unit controllers from the system and replacing it with a new device of the same type having a programmable microprocessor and a unique serial number;

querying each of the drive units and drive unit controllers of the control system to identify the device address numbers for all drive unit controllers or drive units respectively assigned to the removed device as well as the preset position information associated with the assignments;

storing the identified device address numbers and preset position information in a database of stored information on the microprocessor of the new device; and

modifying the database of stored information for each of the drive units and drive unit controllers of the system to associate the unique serial number of the new device at the device address number for the removed device.

33. The method according to claim 31, further including the steps of:

identifying at least one drive unit or drive unit controller for removal from the control system;

operably connecting a programming device to the communication bus of the control system, the programming device capable of accessing and retrieving the stored information from the microprocessor of a drive unit or drive unit controller and programming the retrieved information into the microprocessor of another drive unit or drive unit controller;

accessing and retrieving the stored information from the microprocessor of each of the identified drive units or drive unit controllers using the programming device;

removing each of the identified drive units or drive unit controllers from the system and replacing it with a new device of the same type having a microprocessor and a unique serial number;

programming the information retrieved from each of the removed drive units or drive unit controllers into the microprocessor of the new device replacing the removed drive unit or drive unit controller using the programming device; and

updating the database of stored information for each of the drive units and drive unit controllers of the system to identify the serial number of the new device at the device address number for each of the identified and replaced devices.

34. The method according to claim 31, further including the steps of:

linking the common communication bus of a first shade control system having addressed drive units and drive unit controllers with the communication bus of a second shade control system having separately addressed drive units and drive unit controllers such that a merged control system is formed;

querying all of the drive units and drive unit controllers of the merged control system to identify repeated device address numbers;

selecting one drive unit or drive unit controller associated with each of the repeated device address numbers and changing its device address number to a device address number that is unused in the merged control system; and

updating the stored information for each of the drive units or drive unit controllers assigned to the selected drive unit or drive unit controller to associate the new

device address number with the serial number of the selected drive unit or drive unit controller.